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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/612,241	07/01/2003	James Lovette	COOL-01400	3319

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EXAMINER	
DUONG, THO V	

ART UNIT	PAPER NUMBER
3743	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/612,241	LOVETTE ET AL.	
	Examiner	Art Unit	
	Tho v Duong	3743	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-81* is/are pending in the application.

4a) Of the above claim(s) *4,25,26,31,32,38,54,55,60,61 and 66-81* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-20,27-30,33-37,39-49,56-59 and 62-65* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3,6,7,9,10/04;3/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 4,25-26,31-32,38,54-55,60-61 and 66-81 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species and group, there being no allowable generic or linking claim. Election of species of figure 2 was made **without** traverse in the reply filed on 3/1/2005.

Specification

The attempt to incorporate subject matter into this application by reference to docket number is improper because the attorney docket number can be changed and not known to the examiner. Furthermore, the application number and filing date of the reference are not known.

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract of the disclosure is objected to because the abstract uses phrases, which can be implied such as "is disclosed". Correction is required. See MPEP § 608.01(b).

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the claimed subject matter of "the heat generating device is formed integrally with the bottom surface of the interface layer" and "the patterned semiconductor is formed on an interface layer" must be shown or the feature(s) canceled from claims 27,57,58 and 63. No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-3,5-24,27-30,33-37,39-53,56-59 and 62-65 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Regarding claims 1,20,49 and 35, the claimed subject matters of "the first plurality of openings and the second plurality of openings lie substantially in a single plane" or "the plurality of routes each substantially contained in a plane non-parallel to a heat exchange plane" renders the scope of indefinite since it is known in the art that a "plane" has only two dimensions, it does not have a thickness. It is not clear how the openings (105,110,115) or routes, which has a thickness dimension, can be lie in a single plane .

Claims 1-3,5-20,27-30,33-37,39-49,56-59 and 62-65 are further rejected as can be best understood by the examiner.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-6,8,20,27,29,30,35-37,39-40,42,49,56 and 59 are rejected under 35 U.S.C. 102(b) as being anticipated by Galyon et al. (US 5,016,090). Galyon discloses (figures 8, 9 and column 7, lines 37-45) a heat exchanger comprising a manifold layer (802) having a first plurality of openings (808) for providing a cooling material to the heat exchanger and a second

plurality of openings (809,810) for removing the cooling material from the heat exchanger; an interface layer (800,906) coupled to the manifold layer, the interface layer having a plurality of adjacent routes (901,902,903) that extends from one of the first plurality of openings and terminates at a corresponding one of the second plurality of openings, the routes for carrying the cooling material, the plurality of routes each substantially contained in a plane non-parallel to a heat exchanging plane (bottom of 903) wherein a chip coupled to the bottom surface of the interface layer and the thermal interface layer comprises a copper or any other good heat conducting material.

Claims 1-3,5-6,8,15-19,20,27,29,30,34-37,39,40,42,49,56,59 and 62 are rejected under 35 U.S.C. 102(b) as being anticipated by A. Meyerhoff et al. (US 3,361,195). Meyerhoff discloses (figures 6-12) a heat exchanger comprising a manifold layer (208) having a first plurality of openings (218) for providing a cooling material to the heat exchanger and a second plurality of openings (214) for removing the cooling material from the heat exchanger; an interface layer (206) coupled to the manifold layer, the interface layer having a plurality of adjacent routes (210) that extends from one of the first plurality of openings and terminates at a corresponding one of the second plurality of openings, the plurality of routes each substantially contained in a plane non-parallel to a heat exchanging plane (bottom of 903) wherein a semiconductor (204) coupled to the bottom surface of the interface layer and the thermal interface layer comprises metal or any base alloy thereof. Meyerhoff further discloses (column 6, lines 45-47) that the manifold layer and the interface layer may be form a monolithic device. Meyerhoff further discloses (column 1) that air or gas was also known to use as a cooling fluid

and vapor is a form of evaporated liquid such as water being sufficiently heated by the semiconductor (204) to become vapor.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7,9-14,41 and 43-48 are rejected under 35 U.S.C. 103(a) as obvious over Meyerhoff. Meyerhoff substantially disclose all of applicant's claimed invention as discussed above except for the suitable material of the thermal interface layer. It would have been obvious to one having ordinary skill in the art at the time the invention was made to choose the suitable material as claimed for the thermal interface layer, since it has been held to be within the general skill of a worker in the art to select known material on the basis of its suitability for the intended use as a matter on obvious design choice. In re Leshin, 125 USPQ 416. Furthermore, applicant does not disclose any criticality or unexpected result for selecting the claimed material. Moreover, it appears that the interface layer would perform equally well with any conductive material. Accordingly, the use of material is deemed to be a design consideration which fails to patentably distinguish over the prior art of Meyerhoff.

Claim 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meyerhoff in view of Messina (US 5,309,319). Meyerhoff substantially discloses all of applicant's claimed invention as discussed above except for the limitation that a pump is provided in the inlet

opening. Messina discloses (figure 1 and column 4, lines 60-68) a fluid cooling system that has a pump (50) connected to an inlet opening (100) for the purpose of pumping the coolant into the cooling system. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Messina's teaching in Meyerhoff's device for the purpose of pumping the coolant into the cooling system.

Claim 64 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meyerhoff in view of Mathews (US 5,274,920). Meyerhoff substantially discloses all of applicant's claimed invention as discussed above except for the limitation that the plate with flow channels are formed by stamping. Mathews discloses (figures 1-4, column 2, lines 25-28 and column 5, lines 42-47) that stamping process has been used in forming flow channels on face of a plate for the purpose of simplifying the manufacturing steps of the cooling system. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Mathews's teaching in Meyerhoff's system for the purpose of simplifying the manufacturing steps of the cooling system.

Claim 65 is rejected under 35 U.S.C. 103(a) as being unpatentable over Meyerhoff in view of Wang (US 6,477,045 B1). Meyerhoff substantially discloses all of applicant's claimed invention as discussed above except for the limitation that the plate with flow channels is made of injection molding. Wang discloses (figure 3 and column 2, lines 36-56) that an injection molding process has been used to form a plate with flow channels for the purpose of forming a metal thermal interface layer in a cooling system with a known process in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use

Wang's teaching in Meyerhoff's system for the purpopse of forming a metal thermal interface layer with a known process in the art.

Claims 28,57,58 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Meyerhoff in view of Bonde et al. (US 5,099,311) and Park et al. (US 6,492,200) or Tuzi et al. (US 3,771,219). Meyerhoff substantially discloses all of applicant's claimed invention as discussed above except for the limitation that a heat generating device is integrally formed at the bottom of the interface layer. Bonde discloses (figures 2 and 8) an integrated cooling system that has the interface layer (40), which is a silicon wafer, that an integrated circuit (120) and leads (122) are formed directly on the wafer for the purpose of enhancing the cooling of the integrated circuit chip since the thermal distance between the cooling channel and the integrated circuit chip is shorter than having both layers of the interface layer and the electronic substrate. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use Bonde's teaching in Meyerhoff's device for the purpose of enhancing the cooling of the integrated circuit chip since the thermal distance between the cooling channel and the integrated circuit chip is shorter than having both layers of the interface layer and the electronic substrate. Both Meyerhoff and Bonde do not disclose that the method of patterning and etching steps in forming the semiconductor device. However, patterning and etching steps are well known in the semiconductor manufacturing area. Attention is now directed to either Tuzi et al or Park et al. Both Tuzi and Park disclose a method for manufacturing a semiconductor device that comprises the steps of patterning a semiconductor device and etching the patterned semiconductor device on a wafer for the purpose of providing a semiconductor device with simple process and low cost. It would have been obvious to one having ordinary skill in the art

at the time the invention was made to use either Tuzi or Park's teaching in the combination device of Meyerhoff and Bonde for the purpose of providing a semiconductor device with simple process and low cost.

Allowable Subject Matter

Claims 21-24 and 50-53 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Calaman et al. (US 6,578,626) discloses a liquid cooled heat exchanger with enhanced flow.

McDunn et al. (US 5,675,473) discloses a cooling system.

Newton et al. (US 6,437,981) discloses a thermally enhanced microcircuit package.

Halmilton (US 5,801,442) discloses a microchannel cooling of high power semiconductor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tho v Duong whose telephone number is 571-272-4793. The examiner can normally be reached on M-F (first Friday off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Henry Bennet can be reached on 571-272-4791. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Tho v Duong
Examiner
Art Unit 3743

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March 31, 2005